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AD No.

268417

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Race and Ratio Perception

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62-1-5
XEROX

Technical Report No. 6

December 2, 1961

to the

Office of Naval Research
Washington, D. C.

for

Contract Number Nonr - 2285 (02)

746800

Race and Ratio Perception

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This experiment derives from a psychophysical-perceptual model of a social phenomenon. Specifically the study explores majority-minority group members initial perceptions of the percentage of a given classification of persons in a heterogenous field of human elements represented by a tachistoscopically presented field of objects.

Upon introduction to a new situation the newcomer encounters a multiplicity of potentially impinging stimuli. In order to cope with this bewildering array of elements and signals the newcomer is compelled to limit their reception. The reduction of the field of potential stimuli is presumed to be mediated by the individual's set or perceptual screening processes. As a result, some potential stimuli remain latent; others become manifest either as separate elements or as a class of elements. Furthermore, it is proposed that the newcomer attempts to stabilize the new environment to a degree by locating familiar elements or signals, thereby enabling him to move from the known to the unknown.

A similar process is suggested with regard to the introduction of a new member to a group of strangers. It is proposed that the visual field is organized and simplified in order to interpret or find meaning in the overwhelmingly complex field of potential social stimuli.

The characteristic of the visual field with which the present study is concerned is the ratio of the total number of a designated variety of objects to the total number of objects in the field. This characteristic of the perceptual field was presumed to be particularly salient with regard to the perceiver who is readily distinguishable as a member of a minority group or a low power group with distinguishable characteristics. For example, in the United States, Negroes in contrast to Whites are more likely to find themselves in an heterogeneous group with regard to

race within which the members of their own race are in the minority. Thus, it is proposed that when introduced to a new group heterogeneous with regard to race, the White majority members tend to be less concerned about the ratio of White to Negro members in the social field; whereas the Negroes tend to scan the social milieu for signs of instability or threat represented by extreme race ratios. Furthermore, it is proposed that a self-imposed set is utilized in the scanning process, "concentration of white or unmarked objects." This scanning procedure is employed most frequently under conditions where an objective method of determining the ratio of marked to unmarked objects is not available as, for example, when perceiving a crowd heterogeneous with respect to race. This it is hypothesized, generally, that the anxieties of the visually distinguishable minority group members in contrast to the majority group members tend to lead to a distorted perception of the percentage of marked or unmarked objects in the visual field, particularly when the marked objects represent members of their own minority group.

In addition to the characteristics of the perceiver, various characteristics of the elements in the perceptual field were explored with regard to the perceptual processes associated with ratio estimates: (a) object focused upon (b) the percentage of the total field of elements which the focused elements represent, (c) the heterogeneity of the field of elements; that is, the variety of objects in the field.

Method

Subjects

The subjects (Ss) were ten Negro and ten White Male and Female volunteers from the University of Delaware.

Perceptual Field

Inanimate objects rather than human objects or faces were chosen for the elements

of the perceptual field in order to control for extraneous factors. Moreover, in order to control for possible color fusion effects only black and white objects were presented. A field of sixty objects was considered sufficiently circumscribed to permit scanning under conditions of short exposure yet sufficiently complex in order to demand estimation techniques. Eighty-one slides were developed containing varying combinations of white circles, white circles marked with a plus symbol, and white circles marked with a minus symbol displayed against a black background. The sixty positions in the field were approximately equidistant from each other yet were not arranged in any apparent pattern.

The objects on which the S was asked to focus comprised anywhere from 10% to 90% of the field of objects in intervals of ten. The focused object was paired with each of the other two varieties of objects for any given ratio or percentage as well as with both of the other objects. For example, there were three different slides on which the white circle comprised 10% of the field of objects. On one of these slides 10% of the objects were white circles and the remainder were white circles marked with a minus; a second slide contained 10% white circles and 90% white circles marked with a plus; finally, a third slide contained 10% white circles and the remainder was comprised of 45% plus circles and 45% minus circles. In each of these three slides the positions of the white unmarked circles were constant but the positions were initially randomly assigned. In preparing the three slides composed of 20% white circles, six white unmarked circles were added randomly to the six white circles already in position on the 10% slides by replacing six marked circles. The other slides were prepared in the same manner.

Procedure

The seated subjects viewed the exposed slide through a monocular vision reduction tube. The distance from the eye piece to the screen was 315 centimeters. The S used a chin rest to stabilize the visual field. The 81 slides were presented

in a different random order for each S. Each slide was presented at intervals of approximately five seconds. After a five minute rest period, the 81 slides were again presented to the same S in a second random order. Each slide was exposed tachistoscopically for one second. The S's set for each exposure was established by the E's directions, such as "Ready, zero" or "Ready, Asian" which was followed immediately by the slide exposure.

At the outset of the experiment, the Ss were told that the study in which they were to participate was concerned with the ability of individuals to estimate the percentage of objects included in a visual field containing a number of different objects. Two practice trials were provided; the first practice slide contained two varieties of objects. The focused object for the first practice slide was "zero", for the second practice slide the focused object was "plus".

Two experimental conditions involved the naming of the objects. Under one condition the objects were simply referred to as "zero", "plus", or "minus". Under a second condition the objects were referred to as "Europeans", "Africans", or "Asians". Under the latter condition, and prior to the critical display, the experimenter displayed models of the various objects and asked the S to name what continental people the object represented. When the S was seen to perform without hesitation, the practice trials were introduced. Males and females were proportionally assigned to the experimental conditions.

In summary, the independent variables included the race of the perceiver, (Negro or White); the percentage of focused objects in the field (10% to 90% in intervals of ten); the heterogeneity of the field of objects (two or three different objects); the labelling of the objects as "zero", "minus", "plus", as opposed to "European", "Asian", "African" respectively, and the focused object (unmarked circle, minus-marked circle, or plus-marked circle).

Statistical Analysis

The dependent measure was the estimate of the percentage of focused objects

on the repeated exposures of each slide for each subject. Nine $2 \times 2 \times 9$ analyses of variance for repeated measures (Edwards, 1950) were calculated. Thus, for example, the estimates of the number of unmarked circles was analyzed with regard to the nine percentages for Negro and White subjects and under the object and cultural representation object conditions. Three separate analyses of the unmarked circle conditions were necessary since these objects were displayed with the "minus" objects, the "plus" objects or both the "minus" and "plus" objects, and a combined analyses would have created cells without cases. Similarly, three analyses were necessary for each of the other two varieties of focused objects.

Results

As might be expected, the variance attributable to percent was statistically significant over all nine analyses. Otherwise, however, only the three analyses involving the unmarked circles as focused objects revealed statistically significant results. In all three of these analyses the race of the perceiver proved to be related to the perception of the percentage of unmarked objects in the field. (See Tables 1, 2, and 3. The other tables were omitted in order to conserve space). In each instance the number of unmarked objects was underestimated to a larger degree by Negroes.

In addition, it was observed that the interaction between percentage and social object was statistically significant ($p < .01$; see Table 2). Upon closer inspection these results appear to be attributable to the tendency for the Ss to underestimate "Europeans" when 50% of the objects were unmarked circles, and the remainder were "minus" marked.

Finally, under the conditions where "zeros" were mixed with "pluses", interaction between race and object was significant at the .05 level of confidence. Negroes tended to underestimate the number of unmarked objects to a significantly greater extent between the 20 to 70 range of percentages.

These analyses, however, do not provide any concurrent information concerning two other independent variables, the number of objects in the perceptual field and the object focused upon which S focused. A single analysis including the three focused objects as well as the other independent measures is not possible since this would lead to cells in the factorial design without observations. Analyses including any two of the focused objects is feasible; and since our chief concern was with the Negro and White's perceptions, the analyses was performed only with reference to the objects which were symbolically related to these races; that is, the unmarked and plus circle. A summary of the resulting $2 \times 2 \times 2 \times 9$ analysis of variance for repeated measures is presented in Table 4 (Henderson, 1959).

Insert Table 4 about here

Consistent with the earlier results, interaction between race and object focus was statistically significant at the .10 level of confidence. Although there was no difference with respect to race in estimating the plus circles, Negroes in contrast to Whites tended to underestimate the percentage of unmarked circles.

In addition, the main effects of numbers of different objects in the field, focus, and of course percentage were all statistically significant ($p < .05$). Higher estimates were submitted, in general, when there were three objects in the field; and in general, higher estimates were submitted when focusing on the marked objects.

Finally several first and second-order interactions were statistically significant: interaction between number of objects in the field and % ($p < .001$); interaction between focused object and % ($p < .001$); and interaction among race, number of objects, and % ($p < .01$). In particular, higher estimates were submitted in a field of three objects as opposed to two objects when the percentage of the

focused objects ranged from 20% to 60%. Similarly higher estimates were submitted when focusing on marked objects in contrast to the unmarked objects and when the percentage of the focused objects ranged from 30% to 90%.

One other psychophysical aspect of the experiment is worthy of note. It was observed that the subjective estimates of the percentage of objects of a particular kind were linearly related to the actual percentage of objects displayed (see Table 5).

Insert Table 5 about here

Discussion

The initial hypothesis proposed rather generally that minority group members in contrast to majority group members tend to describe less veridical perceptions of the ratios of marked to unmarked objects, particularly when the marked objects represent members of their own minority group. The hypothesis was supported only in part. The ratio estimates of Negroes and Whites were significantly different when the focused object was unmarked and the background objects were marked with either a plus or a minus symbol. Labelling the objects as "Asian", "African", or "European", was not found to be associated with the S's perceptions of the objects.

The results were surprisingly consistent with respect to the Negro and White's perceptions of the ratios of unmarked objects to marked objects. Regardless of the nature of the perceptual field with respect to heterogeneity or the characteristics of the background objects, the Negro in contrast to the White Ss tended to underestimate to a greater degree the percentage of white, unmarked circles. No differences between races were observed when the Ss focused on the plus-marked or minus-marked objects. Initially, it was proposed that members of minority groups are acutely concerned about ratio estimation. Minority members may be said to interpret ratio majorities and minorities in terms of power dimensions and their associated threat.

The results indicate, however, that whatever the minority member's attitudes toward ratio estimation, the result is a distortion in the direction of underestimation of the unmarked object, particularly in the intermediate range that is, 20% to 70%. These results suggest an inability on the part of Negroes to focus on the unmarked objects and perceive the marked objects as background. Or perhaps, the Negroes' anxiety level is raised under conditions where ratio perception is involved thus interfering with the perceptual process. Here we are invoking the Postman-Bruner conceptualization of needs as related to perception.

The tendency for distortion to occur particularly in the intermediate percentage range may, at first, be attributed to the greater difficulty of discrimination within the range. However, the tendency to distort was observed only with regard to Negroes when focusing on the unmarked objects. By way of explanation, 50% is assumed to be the critical percentage of white objects; that is, any deviation from this figure will create majority and minority categories. Thus, in keeping with the preceding remarks, concern by the minority group members may be at its height in the 50% region.

At this initial stage of investigation of this phenomenon speculation runs little risk of colliding with antithetical results. Further explorations are indicated. For example, the same procedure may be followed to explore the ratio perception of other minority group members such as Orientals, Jews, or women. On the other hand, the perceptual field may be altered and black, white, and yellow colors substituted for symbols employed in the present study. Finally, the perceptions (with and without a set) of minority as compared with majority members of a movie camera's sweep of a crowd heterogeneous with regard to race may lead to further understanding of ratio perception by minority members. In general, the problem concerns the perceptions of a group of people by a newcomer to the group under conditions where opportunities for data collection are limited.

Of course, the characteristics of the culture in which these experiments are

conducted may prove to be a determinant of the results. In this regard, it must be noted that the present experiment was conducted at the University of Delaware where approximately only 20 of the 3500 regular attending students were Negroes. Furthermore, although public schools in the northern section of the State have been integrated recently, schools in the southern part of the State are still segregated.

The results concerning the more traditional aspects of perception indicate that under conditions of direct estimation, subjective probability is linearly related to the observed proportions. These findings corroborate those of several earlier experiments (Philip, 1947; Stevens & Galanter, 1957). Furthermore, it was observed that higher estimates were submitted with reference to the focused object when three rather than two varieties of objects were displayed. These results may suggest a tendency to compare the numerosity of the focused object with only one of the other two objects. Again one is inclined to post hoc speculation. Let it merely be said that the psychophysical-perceptual model of social phenomenon appears to present a promising area of inquiry.

Summary

It was proposed that when a newcomer is exposed to a complex array of elements or social objects, a structuring of the visual field is necessary in order to simplify, interpret, or attach meaning to the overwhelmingly complex field of potentially impinging stimuli. One characteristic of a field of objects which was central to this study was the ratio of the total number of one salient variety of objects to the total field of objects. It was proposed that American Negroes tend to be more concerned than Whites about this characteristic of perceptual field because an overwhelming majority of white members in a group may represent a potential personal threat. Thus, it was hypothesized that minority group members who are visually distinguishable in contrast to majority group members tend to possess a distorted perception of the percentage of marked or unmarked objects in a visual

field, particularly when the marked objects represent members of their own minority group. The associations between various characteristics of the elements in the perceptual field and ratio perception were also explored.

The critical task required the Ss to estimate the percentage of marked or unmarked objects in a field of sixty objects displayed for one second. The independent variables included the race of the perceiver (Negro or White); the percentage of focused objects in the field (10% to 90% in intervals of ten); the heterogeneity of the field of objects (two or three different objects); the labelling of the objects as "zero", "minus", "plus" as opposed to "European", "Asian", "African"; and the focused object (unmarked circle, minus-marked circle, or plus-marked circle).

In general, the Negroes in contrast to the Whites tended to underestimate the percentage of unmarked objects in the perceptual field. These results were interpreted as supporting, in part, the initial framework. Moreover, it was found that higher estimates were submitted when three rather than two varieties of objects were displayed. The psychophysical-perceptual model of social phenomenon was perceived as a promising research framework.

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Table 1

Analysis of Variance of the Estimated Percentage of Focused Unmarked Circles
in a Field of Unmarked and Plus-Marked Circles With Reference to the
Race of the Perceiver, the Label of the Objects, and Varying
Percentages of Unmarked Circles

Source	SS	df	MS	F
A - Race	5268.04	1	5268.04	10.58 **
B - Label	2.02	1	2.02	-
C - %	251685.14	8	32710.64	179.16 ***
AB	574.57	1	574.57	1.15
AC	2606.43	8	390.96	2.14 *
BC	1295.15	8	161.89	-
ABC	725.91	8	90.74	-
D, AB	7969.73	16	498.11	3.28 **
E, DAB	3038.99	20	151.95	-
CD, AB	23368.87	128	182.57	1.21
CE, DAB	24058.51	160	150.37	-

* $p < .05$

** $p < .01$

*** $p < .001$

Note: D,AB = Subjects within treatments

E, DAB = Response with Ss within treatments

Table 2

Analysis of Variance of the Estimated Percentage of Focused Unmarked Circles
in a Field of Unmarked and Minus-Marked Circles With Reference to the
Race of the Perceiver, the Label of the Objects, and
Varying Percentage of Unmarked Circles

Source	SS	df	MS	F
A - Race	7354.61	1	7354.61	5.81 *
B - Label	15.49	1	15.49	-
C - %	229655.26	8	28706.91	110.12 ***
AB	589.60	1	589.60	-
AC	2294.52	8	286.82	1.10
BC	6437.84	8	804.73	3.09 **
ABC	1779.42	8	222.43	-
D, AB	20254.24	16	1265.89	35.51
E, DAB	7130.02	20	35.65	-
CD, AB	33367.16	128	260.68	1.35
CE, DAB	30804.48	160	192.53	-

* p < .05

** p < .01

*** p < .001

Note: The notation is the same as Table 1.

Table 3

Analysis of Variance of the Estimated Percentage of Focused Unmarked Circles
in a Field of Circles Unmarked, and Plus-Marked, and Minus-Marked Circles
With Reference to the Race of the Perceiver, the Label of the Objects,
and Varying Percentages of Unmarked Circles.

Source	SS	df	MS	F
A - Race	3392.88	1	3392.88	6.43 *
B - Label	881.62	1	881.62	1.67
C - %	215378.64	8	26922.33	126.35 ***
AB	15.90	1	15.90	-
AC	3038.35	8	379.79	1.78
BC	1510.11	8	188.76	-
ABC	1238.12	8	154.76	-
C,AB	8448.13	16	528.00	2.45 *
E,DAB	4313.34	20	215.67	-
CD,AB	27274.08	128	213.08	1.45 *
CE,DAB	23509.16	160	146.93	-

* $p < .05$

** $p < .01$

*** $p < .001$

Note: The notation is the same as Table 1.

Table 4

Analysis of Variance of the Estimated Percentage of Focused Objects
 With Reference to the Characteristics of the Focused Object,
 the Race of the Perceiver, the Label of the Object,
 the Heterogeneity of the Field of Objects,
 and Varying Percentages of Focused Objects

Source	MS	df	F	Error Term	p
A - Race	3581.55	1	2.96	F,AB	
B - Label	2066.40	1	1.70	F,AB	
C - Heterogeneity (2 or 3)	5232.65	1	37.97	CF,AB	.001
D - Focused Object (o or +)	24659.50	1	17.55	DF,AB	.001
E - %	120099.90	8	319.46	EF,AB	.001
AB	936.06	1	-	F,AB	
AC	67.18	1	-	CF,AB	
AD	5036.29	1	3.58	DF,AB	.10
AE	281.52	8	-	EF,AB	
BC	60.44	1	-	CF,AB	
BD	281.79	1	-	DF,AB	
BE	374.90	8	-	EF,AB	
CD	548.84	1	3.61	CDF,AB	.10
CE	628.20	8	4.34	CEF,AB	.001
DE	3034.02	8	14.09	DEF,AB	.001
ABC	25.86	1	-	CF,AB	
ABD	6.53	1	-	DF,AB	
ABE	92.33	8	-	EF,AB	
ACD	37.68	1	-	CDF,AB	
ACE	383.72	8	2.65	CEF,AB	.01

Source	MS	df	F	Error Term	p
ADE	335.60	8	1.56	DEF,AB	.10
BCD	524.41	1	3.45	CDF,AB	
BCE	68.46	8	-	CEF,AB	
BDE	97.85	8	-	DEF,AB	
CDE	145.43	8	1.02	CDEF,AB	
ABCD	220.13	1	1.45	CDF,AB	
ABCE	181.25	8	1.25	CEF,AB	
ABDE	127.97	8	-	DEF,AB	
ACDE	216.54	8	1.52	CDEF,AB	
BCDE	200.20	8	1.40	CDEF,AB	
ABCDE	118.36	8	-	CDEF,AB	
F,AB	1211.80	16	-		
G,FAB	226.28	20	-		
CF,AB	137.81	16	-		
CG,FAB	205.73	20	-		
DF,AB	1405.01	16	-		
DG,FAB	129.08	20	-		
EF,AB	375.95	128	-		
EG,FAB	141.34	160	-		
CDG,AB	151.88	16	-		
CDG,FAB	189.53	20	-		
CEF,AB	144.61	128	-		
CEG,FAB	186.12	160	-		
DEF,AB	215.27	128	-		
DEG,FAB	142.71	160	-		
CDEF,AB	142.81	128	-		
CDEG,FAB	121.14	160	-		
			-		

Table 5

Mean Estimated Percentage of Focused Objects
in Relation to the Observed Percentage

Observed %	Focused Object		
	Unmarked Circle	Minus-Marked Circle	Plus-Marked Circle
90	85.8	60.6	81.9
80	75.4	58.9	79.9
70	60.2	48.9	70.4
60	53.1	37.9	63.2
50	38.3	31.1	49.8
40	28.9	23.3	40.6
30	20.7	16.1	25.8
20	15.8	11.2	16.2
10	10.8	7.8	8.5